LAWRENCE LIVERMORE
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Jan. 18-21, 201

Turning the corner on carbon capture

Two holding tanks for CO_2 separated from Huaneng's Shidongkou Power Plant in China. Photo courtesy of the World Resources Institute.

The Shidongkou No. 2 Power Plant in China has hosted a parade of foreign visitors in recent months, from academics and industry officials to U.S. Energy Secretary Steven Chu. All have asked: Have Chinese engineers turned a corner on carbon-capture technology?

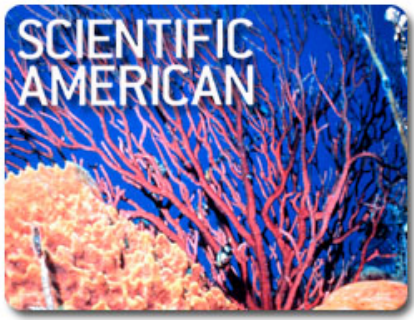
The buzz began in late 2009, after officials at the government-owned Huaneng Group opened a facility that captures some of the carbon dioxide emitted by the existing giant 1,320-megawatt coal-fired Shidongkou power station. The system scrubs roughly 120,000 tons of CO_2 a year from 3 percent of the facility's flue gases, at a price of $30-$35 per ton of CO_2.

That is far below the $100 or more estimated for first-generation projects to retrofit existing power plants for carbon capture and storage (CCS) in the United States and Europe. If similar cost reductions can be realized elsewhere, they could cut years off the timetable for commercial introduction of retrofitted CCS technology, touted as a way to reduce the climatic impact of existing coal plants. Experts want to know how the Chinese facility is doing it, and whether the savings could be exported.

"A lot of people want to know whether that work will translate into other markets, and I believe we'll be able to shed a lot of light on that question," says Julio Friedmann, carbon-management program leader at the Laboratory. Friedmann also serves as technical director for the U.S.-China Advanced Coal Technology Consortium, which will conduct the assessment.

To read more, go to the Web.

Speeding up Mother Nature



Using seawater and calcium to remove carbon dioxide (CO_2) in a natural gas power plant's flue stream, and then pumping the resulting calcium bicarbonate in the sea, could be beneficial to the oceans' marine life.

Greg Rau, a senior scientist with the Institute of Marine Sciences at UC Santa Cruz who also works in the Carbon Management Program at the Laboratory, conducted a series of lab-scale experiments to find out if a seawater/mineral carbonate (limestone) gas scrubber would remove enough CO_2 to be effective, and whether the resulting substance -- dissolved calcium bicarbonate -- could then be stored in the ocean, where it also might benefit marine life.

In addition to global warming effects, when CO_2 is released into the atmosphere, a significant fraction is passively taken up by the ocean in a form that makes the ocean more acidic. This acidification has been shown to be harmful to marine life, especially corals and shellfish.

At scale, Rau's process would hydrate the carbon dioxide in power plant flue gas with water to produce a carbonic acid solution. This solution would react with limestone, neutralizing the CO_2 by converting it to calcium bicarbonate -- and then would be released into the ocean. While this process occurs naturally (carbonate weathering), it is much less efficient and is too slow-paced to be effective.

To read more, go to the Web.

A cooperative opportunity

The Lab's Julio Friedmann, leader of LLNL's carbon management program, recently opined about the opportunity for President Obama and Chinese President Hu Jintao to cooperate when it comes to clean energy technology.

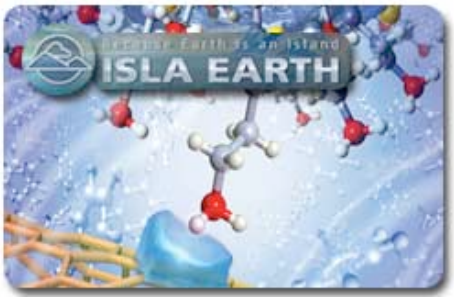
As the largest consumers of energy, users of coal and emitters of carbon dioxide in the world, the U.S. and China must cooperate when it comes to the development, testing and commercialization of clean energy technology. Without collaboration, both countries will suffer the potentially catastrophic effects of climate change, according to Friedmann, who co-authored the piece with Orville Schell, member of the Council on Foreign Relations and Arthur Ross, director of the Center on U.S. China Relations, Asia Society.

The U.S. and China can act unilaterally on efficiency, and they have.

"Unilateral action is possible, even desirable, and the costs are relatively modest," Friedmann and Schell say.

To read more, go to the Web.

Drinking in the ocean



As populations and water use rise, the world's freshwater supply is shrinking. Desalinating seawater could be an option; for a price. The common method, reverse osmosis, uses a large amount of energy.

But the Laboratory has come up with a new way of desalinating by using carbon nanotube membranes. The hollow molecules are made up of tubes that are 50,000 times thinner than a human hair.

They are more permeable than traditional membranes. It's like having a garden hose that delivers as much water as a fire hose. It could reduce desalination energy costs by as much as 75 percent.

To hear more, go to the Web.

Energy companies on the go

A group of utility, energy-related companies and national laboratories, including LLNL, signed deals to research and build new cleaner-energy infrastructure in China as part of a government summit in Washington this week.

The U.S.-China Clean Energy Research Center, in which the Laboratory is a key member, will use $12.5 million of federal grant money to develop new "clean coal" equipment that would cut down on air pollution from power plants.

Utility company General Electric announced it entered a joint venture to develop coal gasification equipment with Chinese company Shenhua. The deal establishes a joint venture company for GE and Shenhua to sell industrial coal gasification technology licenses, lobby for more coal gasification facilities and develop new products.

To read more, go to the Web.

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institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

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